THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[SEVENTH SERIES.]

No. 46. OCTOBER 1901.

XXXVI.—*Notes on the Classification of Teleostean Fishes.*—I. *On the* Trachinidæ *and their Allies.* By G. A. Boulenger, F.R.S.

In his remarks on the Trachinoid Fishes, in 1861 *, Dr. Günther explained that this family had been established by him "for those Acanthopterygian Fishes which have the spinous portion of their dorsal fin much less developed and shorter than the soft, the anal fin similarly developed to the soft dorsal, and the ventrals composed of one spine and five rays. Their gill-openings are wide and the caudal portion of their vertebral column is formed by many more vertebræ than the abdominal" †. "Such," he added, "are the positive characters by which they may be easily distinguished from the Sciænidæ, Carangidæ, Blenniidæ, Gobiidæ, Trichonotidæ, &c.; whilst the negative character, that of the absence of an infraorbital bone joined to the præoperculum, distinguishes them from the Cottidæ. Other negative characters, as, for instance, the absence of finlets behind the dorsal and anal, the entire absence or the small number of pyloric appendages, separate them from some of the Scomberoid genera,

* Ann. & Mag. Nat. Hist. (3) vii. 1861, p. 85.

† This latter character is incorrect so far as *Uranoscopus* and *Chænichthys* (*Champsocephalus*) are concerned.

which otherwise would appear to have a great affinity to them." He then divides the family into four groups, as follows:—

Eyes on the upper surface of the head; lateral line continuous	a. *Uranoscopina.*
Eyes more or less lateral; lateral line continuous; no larger tooth on the posterior portion of the intermaxillary	b. *Trachinina.*
Eyes lateral; a larger tooth on the posterior portion of the intermaxillary	c. *Pinguipedina.*
Lateral line interrupted or not continued to the caudal fin; one dorsal.....	d. *Pseudochromides.*
Lateral line interrupted *; two dorsal fins	e. *Notothenïina.*

This arrangement, slightly modified from that proposed in the 'Catalogue of Fishes,' was still maintained in the 'Study of Fishes' in 1880, and has been followed, with greater or less modifications, bearing chiefly on the hierarchical importance of the divisions, by most subsequent writers.

It will strike one, however, that hardly any account has been taken of osteological characters or of the position of the ventral fins, to which, as a rule, very great importance is attached. And any one at all familiar with fishes will soon discover that the Trachinidæ are made up of a very incongruous assemblage of genera, connected together merely by trivial characters of the most superficial nature, such as the position of the eyes, the extent of the dorsal and anal fins, &c.

Although I am, I believe, the first to repudiate this association altogether on osteological grounds, and to apply the results of a study of its components to a radical reconstruction of the taxonomic system, I am not by any means the first to perceive its defects. Dr. Gill † and Bleeker ‡ especially have expressed dissent, although, in my opinion, the changes they have proposed are far from having all been improvements.

Dr. Gill, in 1861 §, after excluding the Uranoscopina, Penguipedina, and Pseudochromides, proposed to split up

* Should read "lateral lines two."

† "Synopsis of the Sillaginoids," Proc. Ac. Philad. 1861, p. 501; "Synopsis of the Chænichthyoids," *t. c.* p. 507; "Synopsis of the Harpagiferoids," *t. c.* p. 510; "Synopsis of the Notothenioids," *t. c.* p. 512; "On the Limits and Affinity of the Family of Leptoscopoids," *op. cit.* 1862, p. 501; "Arrangement of the Families of Fishes," Smithson. Miscell. Coll. xi. no. 247 (1872); "Families and Subfamilies of Fishes," Mem. Ac. Sc. Washingt. vi. 1893, p. 127.

‡ "Mémoire sur les Sciénoïdes et les Sillaginoïdes," Verh. Akad Amsterd. xiv. no. 4 (1874); "Sur la Famille des Pseudochromidoïdes," *op. cit.* xv. no. 5 (1875).

§ Proc. Acad. Philad. 1861, p. 514.

Dr. Günther's Trachinidæ into seven families, which he thus defined :—

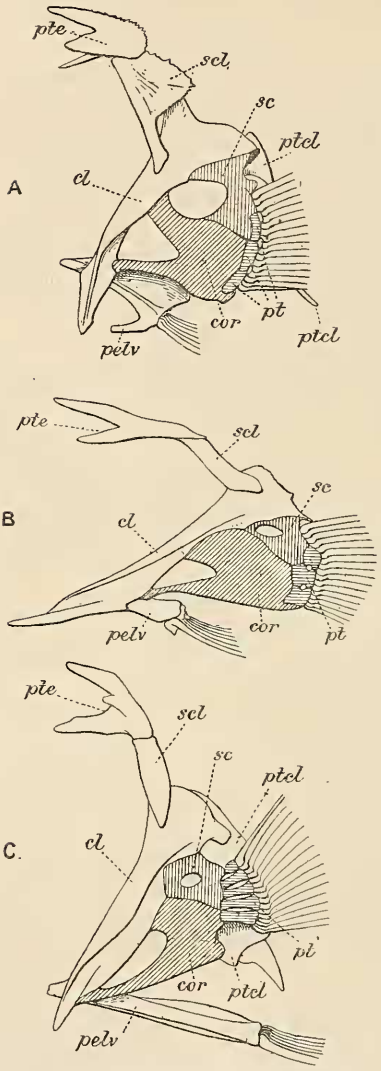
I. Lower pectoral rays simply articulated.
  A. Ventral fins thoracic. First and second dorsals subequal ..... *Trichodontidæ.*
  B. Ventral fins jugular.
    1. Ventrals approximated. Anal very long. Body scaly ..... *Trachinidæ.*
    2. Ventrals separated by a wide area. Anal moderate. Body naked ..... *Bovichthyidæ.*
II. Lower pectoral rays branched.
  A. Head cavernous. Præoperculum abruptly bent inwards beneath the head. Ventrals thoracic. *Sillaginoidæ.*
  B. Head with bones not cavernous. Ventrals jugular or subjugular.
    1. Snout not produced. Body scaly.
      a. Lateral line submedian along tail ..... *Latiloidæ.*
      b. Lateral line interrupted or continuous on the tail ..... *Notothenioidæ.*
    2. Snout spatuliform. Body naked ..... *Chænichthyoidæ.*

The characters used in this synopsis are mostly very trivial and inadequate for establishing families, nor, with the exception of that derived from the position of the ventral fins, has their diagnostic value been confirmed by the examination of the skeleton which has since been made.

In his latest arrangement of the fishes, in 1893, the families are thus dispersed by Dr. Gill. The divisions are, however, unaccompanied by definitions :—

I. Related to Percoidea : *Sillaginidæ.*
II. Percophoidea (described as an undoubtedly heterogeneous group in need of a thorough revision) : *Pseudochromidæ, Malacanthidæ, Bathymastridæ, Percophiidæ, Nototheniidæ, Harpagiferidæ, Chænichthyidæ, Chiasmodontidæ, Opisthognathidæ, Bovichthyidæ, Trichodontidæ, Hemerocœtidæ.*
III. Trachinoidea : *Trachinidæ.*
IV. Uranoscopoidea : *Uranoscopidæ, Leptoscopidæ, Dactyloscopidæ.*

An examination of *Trachinus* shows that it differs essentially from the Perciformes in the truly jugular position of the ventrals and in the structure of the pectoral fin, which is supported by the scapula and short and broad pterygials, of which only two are in contact with the scapula (fig. A, p. 264) ; and these two characters I consider to be diagnostic of the forms truly related to *Trachinus.* Whilst in the "thoracic" Perciformes the pectoral fin is entirely supported by the pterygials, which are more or



Shoulder-girdle and pelvis of
A. *Trachinus draco*. B. *Percophis brasilianus*. C. *Caulolatilus princeps*.

cor. Coracoid.
cl. Clavicle.
pelv. Pelvis.
pt. Pterygials.
ptcl. Post-clavicle.
pte. Post-temporal.
sc. Scapula.
scl. Supraclavicle.

less narrow and hourglass-shaped, and of which at least three are in contact with the scapula (fig. C). Further, the shoulder-girdle of *Trachinus* differs from that of the Perciformes in having the scapular fenestra pierced not within the scapula, but between it and the coracoid, in this respect resembling the likewise jugular Gadidæ †, which may be distinguished by the narrower and hourglass-shaped pterygials and the ribs inserted on long parapophyses.

Availing myself of other characters which I have found to offer reliable indications of relationship in different groups of Acanthopterygians, I would add that the second suborbital is produced in an internal lamina supporting the globe of the eye, that the ribs and epipleurals are nearly equally developed and sessile, close together at the base, and that the posterior præcaudal vertebræ emit short parapophyses.

These characters serving to diagnose the Trachinidæ, with the single genus *Trachinus*, we may examine how far the other genera previously associated with them agree or disagree and what appear to be their relationships.

Among the forms of the southern hemisphere there are several genera that agree with *Trachinus* in the structure of the pectoral arch and pelvis and also in the vertebral column, which differ only in the absence of a subocular lamina. These, enumerated in the following synopsis, may be grouped together under the name Nototheniidæ.

I. Gill-membranes free or narrowly attached to the isthmus.	
A. Dorsal formed of two portions, which may be united at the base.	
1. Two lateral lines, the lower of which may be confined to the caudal region.	
Body covered with ctenoid scales	*Notothenia*, Rich.
Body naked; lateral line with granulated plates; snout spatulate	*Chænichthys*, Rich.
Body entirely naked; snout spatulate	*Champsocephalus*, Gill.
2. Three lateral lines; body naked	*Cryodraco*, Dollo.*
3. A single lateral line.	
a. Body scaly.	
a. Dorsal fins more or less united at the base; a feeble opercular spine.	

† This character has been employed by Cope (Tr. Amer. Philos. Soc. xiv. 1871, p. 458) and by Gill (Proc. Acad. Philad. 1884, p. 170) to define the "Anacanthini," but they do not appear to have been aware of its being shared by the Trachinidæ, Nototheniidæ, Trichonotidæ, and Callionymidæ. Jordan and Evermann (Fish. N. Amer. iii. p. 2528) even add that it differentiates the "Anacanthini" from all other typical fishes.

Teeth on vomer and palatines	*Parapercis*, Blkr.[1]
Teeth on vomer only	*Neopercis*, Stdr.
β. Dorsal fins perfectly distinct.	
Teeth on vomer and palatines; head armed	*Centropercis*, Ogilby.*
Teeth on vomer and palatines; opercle with a flat spine	*Pseudaphritis*, Casteln.[2]
Teeth on vomer only; a præorbital spine	*Acanthaphritis*, Gthr.
Palate toothless	*Eleginops*, Gill.[3]
b. Body naked; habit cottoid	*Bovichthys*, C. & V.
B. A single dorsal; scales extremely small; snout spatulate; palate toothless.	
Lateral lines two; opercular spines	*Gerlachia*, Dollo.*
Lateral line single; opercular spines	*Bathydraco*, Gthr.
Lateral line single; no opercular spines	*Racovitzia*, Dollo.*
II. Gill-membranes broadly united to the isthmus; habit cottoid; body naked; head armed	*Harpagifer*, Rich.

The genera marked with an asterisk are only known from the external characters, and so long as the bones at the base of the pectoral fin have not been examined their correct systematic position remains uncertain, as some may belong to the Leptoscopidæ. *Pagetodus*, Rich., rests on an insufficient description and figure.

In *Percophis*, which has always been regarded as allied to *Parapercis*, the pectoral rays and the pterygials are in the same condition as in *Trachinus*, and a subocular lamina is likewise present; but the scapular fenestra is situated entirely in the scapula (fig. B, p. 264). This genus constitutes the family Percophiidæ.

Bembrops, Stdr. (*Hypsicometes*, Goode), which resembles some of the Nototheniidæ, and the freshwater genus *Chimarrhichthys*, Haast, differ from the preceding only in the absence of the subocular lamina. With them I would also associate *Leptoscopus*, which, in spite of the great external resemblance it bears to *Uranoscopus*, differs from it not only in the much more elongate caudal region, but in the distinct pterygials, the sessile ribs, and the feebly developed parapophyses. The name of this family, which leads to the Batrachidæ, should be Leptoscopidæ.

The Uranoscopidæ, thus reduced to *Uranoscopus*, *Anema*, and *Cathetostoma*[4], are characterized by the much reduced pterygials, fused with the scapula and the coracoid, the scapular fenestra in the scapula, the parapophyses strongly

[1] *Percis*, Bl. Schn., *nec* Scopoli.
[2] *Aphritis*, Cuv., *nec* Latr.; *Cottoperca*, Stdr.
[3] *Eleginus*, Cuv., *nec* Fischer.
[4] *Dactyloscopus* does not differ from *Clinus* in its pectoral arch. I therefore follow Dr. Günther in placing it with the Blenniidæ.

developed on most of the præcaudal vertebræ, with the ribs attached to their upper surface.

All these families are nearly related, and may be placed together as "Trachinoidea" if it be thought advisable to retain the group. All lack the air-bladder.

The following tabulation of the numbers of vertebræ (præcaudal+caudal) in the skeletons examined shows that too great an importance has been attached to this character in defining higher groups, a view which accords with the results obtained in other large families of fishes *.

Trachinus draco	11+32=43.
—— *vipera*	10+25=35.
Notothenia tessellata	16+33=49.
—— *coriiceps*	19+34=53.
Champsocephalus esox	28+29=57.
Parapercis nebulosa	11+19=30.
Pseudaphritis Urvillii	14+27=41.
—— *gobio*	14+27=41.
Eleginops maclovinus	20+25=45.
Bovichthys variegatus	15+23=38.
Harpagifer bispinis	12+24=36.
Percophis brasilianus	22+35=57.
Leptoscopus macropygus	10+33=43.
—— *angusticeps*	10+36=46.
Uranoscopus scaber	12+13=25.
Anema monopterygium	14+16=30.
Cathetostoma læve	14+16=30.

The Trichonotidæ (*Trichonotus*, *Tæniolabrus*, and *Hemerocætes*) and the Callionymidæ (*Callionymus* and *Vulsus*) are closely related to each other and to the Trachinoids, and might be included among them †. The fenestra is between the scapula and the coracoid, and only one or two pterygials are in contact with the scapula. A subocular lamina is absent; there are no epipleurals; the parapophyses are short and restricted to the posterior præcaudal vertebræ. In the Trichonotidæ the post-temporal is forked and detached from the skull, as in the Trachinoids; in the Callionymidæ it is also forked, but closely adnate to the skull. The vertebral column of *Callionymus* is very peculiar, and recalls some of the Plectognaths: some of the præcaudal vertebræ have bifid processes to the neural arch, simulating a "spina bifida," and the last two caudal vertebræ are much enlarged. *Trichonotus*,

* *Cf.* tabulation of vertebræ in Serraninæ, Cat. Fish. 2nd ed. i. p. 115.

† The genus *Rhyacichthys*, n. n. (*Platyptera*, C. & V., *nec* Meig.), from the fresh waters of Java, Celebes, the Philippines, and China, which so closely resembles in its adaptive features *Chimarrhichthys*, *Homaloptera*, and *Exostoma*, belongs to the Gobiidæ.

Hemerocœtes, and *Callionymus* agree in having the three occipital cavities for articulation with the first vertebra on a straight transverse line. All three lack the air-bladder.

Number of vertebræ :—

Trichonotus setigerus	23+30=53.
Hemerocœtes acanthorhynchus.	14+34=48.
Callionymus lyra	7+14=21.
—— *calaropaumus*.....	7+14=21.

A study of the pectoral arch in the "Trachinoid" and "Callionymoid" Fishes shows them to be more closely related to the Gadoids than was hitherto suspected, and it seems to me natural to associate them, together with the Blennioids and Batrachoids, with which they are intimately connected, in a division of the Acanthopterygii, for which the old name Jugulares may be revived. In a later communication I hope to deal with the other members of this great division.

The following forms, which have been associated with the "Trachinoids" by some authors, should be removed from the Jugulares.

1. The Chiasmodontidæ of Gill, which include two deep-sea genera: *Chiasmodon*, Johns. (*Ponerodon*, Alcock), and *Pseudoscopelus*, Lütk. The first was placed with the Gadidæ by Günther, the second with the Berycidæ by Lütken; both near the Trachinidæ by the American authors, among them by Alcock. I have ascertained on *Chiasmodon niger* that the pelvic fins have no connexion with the pectoral arch, fall therefore under the category of abdominal ventrals, that the scapular fenestra is entirely in the scapula, and that the pterygials are small and hourglass-shaped, four in number, three in contact with the scapula.

Chiasmodon is not entirely naked, as has been stated *; it has a series of scales following the course of the lateral line. There are not five, but six ventral rays. An air-bladder is present. According to Alcock the vertebræ number 14+24.

Champsodon, Gthr., referred by Günther and by Alcock

* *Chiasmodon subniger*, Garman, from the Tropical Pacific (919 fath.), is described as having the skin thickly beset with fine spinuloid scales, presenting a pilose appearance. It should probably be made the type of a distinct genus.

to the Trachinidæ, by Gill to the Chænichthyidæ, is related to *Chiasmodon*, and apparently also to *Pseudoscopelus*, with which it agrees in having a complicated system of sensory organs on the body. The ventrals, although situated below the pectorals, are not strictly thoracic, since the pelvis is loosely attached, merely by ligament, to the pectoral arch; the post-temporal is forked; the suborbital arch absent; vertebræ 32 (16+16); strong parapophyses commencing from the third vertebra, the ribs and epipleurals inserted close together near their extremity; a large air-bladder, the pointed posterior extremity of which is encased in a bony capsule formed by the expansion of the parapophyses of the last four præcaudal vertebræ.

The conformation of the pectoral arch and the mode of attachment of the pelvis are opposed to the association of the Chiasmodontidæ with either the Gadidæ or the Trachinidæ in their widest sense. The number of rays to the ventral fin (I 5) is against their incorporation among the Berycidæ, to which, besides, they show no sort of resemblance. The Chiasmodontidæ should, perhaps, provisionally be placed near the Percesoces, together with the Stephanoberycidæ and Tetragonuridæ, but nothing definite can be suggested until the skeleton of the two latter types has been examined.

2. The Trichodontidæ (genera *Trichodon* and *Arctoscopus*), in spite of a superficial resemblance to *Trachinus*, should be referred to the Perciformes. The ventrals are thoracic, the pectorals are entirely supported by five hourglass-shaped pterygials, of which four are in contact with the scapula. *Trichodon Stelleri* has 51 vertebræ (16+35) and no epipleurals; the air-bladder is absent.

This family is most nearly related to the Latrididæ *.

3. The Sillaginidæ, with the single genus *Sillago*. This genus has been referred by Günther to the Trachinidæ on account of the general resemblance it bears to *Percis* (*Parapercis*). But Cuvier, who had made an anatomical examination of these fishes, was much nearer the truth when he gave it as his opinion that they are most nearly allied to the Sciænidæ, from which he separated them on account of the vomerine teeth. In the structure of the pectoral arch, the thoracic ventrals, the presence of an air-bladder, they differ from the Trachinidæ and agree with the Sciænidæ, and they should therefore be placed near the latter, from which they can only be separated by the presence of vomerine teeth and the elongate anal fin. In the high number of vertebræ

* Boulenger, Ann. & Mag. Nat. Hist. (6) xviii. 1896, p. 398.

(12–14+14–20) they approach *Collichthys* (11+18) and *Lonchurus* (10+19). I therefore accept the family Sillaginidæ of Richardson as defined by Gill and by Bleeker.

The oblong and elongated cavernous head, with the præopercle bent inwards below, covering a considerable part of the lower surface of the head, recalls *Aspro* among the Percidæ, with which genus *Sillago* has been associated by Bleeker in 1859.

4. The Pseudochromididæ of J. Müller and of Bleeker (partim), including the Malacanthidæ of Günther, the Latilidæ and Opisthognathidæ of Gill, the Bathymasteridæ of Jordan, are Perciformes closely related to the Serranidæ and connected with them through *Plesiops* and allies. The ventrals are truly thoracic, the pelvis being in every way similar to that of the Perches; they are, however, sometimes a little anterior to the insertion of the pectorals, just as in *Centropristes* among the Serranidæ and *Xyrichthys* among the Labridæ, and such a position has been described as "subjugular." Second suborbital with an internal lamina; entopterygoid present; post-temporal forked; anterior vertebræ without transverse processes; ribs inserted on the transverse processes where these are developed; epipleurals inserted at base of ribs; dorsal and anal fins elongate and formed mostly of articulated soft rays.

Nine genera:—

A. With two lateral lines: *Pseudochromis*, Rüpp.; *Cichlops*, M. & T.

B. With a single lateral line: *Opisthognathus*, Cuv.; *Latilus*, C. & V.; *Caulolatilus*, Gill; *Lopholatilus*, Goode & Bean; *Malacanthus*, Cuv.; *Bathymaster*, Cope; *Rathbunella*, Jord. & Everm.

The following table of vertebræ is for comparison with the Serranidæ *:—

	A.	B.	C.	D.	E.	F.	G.	H.
Pseudochromis persicus	26	10	2	3	1	4	2	16
Opisthognathus muscatensis ..	29	11	2	3	1	5	0	18
Latilus argentatus	24	11	2	0	0	9	1	13
Caulolatilus princeps	27	12	2	0	0	10	0	15
Malacanthus Plumieri	24	10	2	0	1	7	0	14
Bathymaster signatus	51	15	2	1	0	12	4	36

A. Total number. B. Præcaudal. C. Ribless, bearing only epipleurals. D. With sessile ribs and no parapophyses. E. With sessile ribs and parapophyses. F. With ribs attached to parapophyses. G. Præcaudal, with closed hæmal arch. H. Caudal.

* Cat. Fish. 2nd ed. i. p. 115.

5. The Pinguipedidæ, with the single genus *Pinguipes*, agree in all respects with the preceding, but as they lack the subocular lamina they should be regarded as a distinct family. *P. chilensis* has 38 vertebræ (17 + 21). These fishes bear a certain resemblance to the Labrid *Malopterus*, C. & V. (*Neolabrus*, Stdr.), the skeleton of which is still unknown; but its ally *Ctenolabrus* has 15–17 + 18–19 vertebræ, which is very near the number in *Pinguipes*.

XXXVII.—*New Insular Forms of* Nasua *and* Dasyprocta.

By Oldfield Thomas.

When examining material in connexion with the new forms of *Nasua* described last month, the specimens from Cozumel Island in the Bay of Honduras struck me as peculiar, and now that the skulls have been prepared I find that this animal should be distinguished from that on the mainland. As I am responsible for its determination as *N. nasica* (see P. Z. S. 1888, p. 129), or *narica*, as I prefer now to call it, I think it well now to set the matter right, and also to point out that another identification made at the same time was erroneous, that of the Agouti from Ruatan, which likewise proves separable from its mainland ally.

Nasua thersites, sp. n.

Size markedly less than in the continental *N. narica*. General colour of head, nape, and posterior back dark brown ("seal-brown"), only grizzled across the shoulders, where the tips of the hairs are whitish or ashy. Continental specimens are usually grizzled further down the back. Bases of the brown hairs but little lighter than their tips. Under surface brown posteriorly on the belly, grizzled with whitish on the chest; the chin white. Face, as usual, brown, with a white muzzle and lips, white spots above and below the eye, and whitish lines leading from the eyebrows to the muzzle. Patches on sides of neck whitish, the hairs brown basally. Ears brown externally, white internally and at their edges. Limbs brown, darkening nearly to black on the hands and feet. Tail shaggy, dark brown throughout, slightly darkening terminally, without trace of grizzling or annulation.

General build of skull distinctly that of the *N. narica* type and quite different from that either of the delicate *N. montana* and *quichua* or of the still slenderer *N. olivacea*, although